REMARKS

Claims 1-34 are pending in the application.

New claim 34 is added to the application above.

No new matter is added to the specification or claims by these amendments.

I. THE DAVID CHARLES BANNISTER DECLARATION

The Applicant is filing a Declaration of David Charles Bannister with this Reply. A copy of Mr. Bannister's Declaration is also attached to Appendix A of this Reply. In his Declaration, Mr. Bannister considers the scope and content of the prior art and identifies differences between the claimed invention and the prior art.

II. TRAVERSE OF THE OBVIOUSNESS REJECTIONS

All claims stand rejected by the examiner for obviousness. In particular, claims 1, 5-6, and 8-22 are rejected for obviousness over Choon et al (USP 5,608,188) in view of Miska (USP 6,901,660), claims1-20 and 23-27 stand rejected for obviousness over Banzoni (USP 5,416,668) in view of Miska, and claims 28-33 stand rejected for obviousness over Benzoni in view of Miska and further in view of Henry (USP 5,098,735).

In rejecting claims under 35 U.S.C. § 103(a), the Examiner bears the initial burden of establishing a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). *See also In re Piasecki*, 745 F.2d 1468, 1472 (Fed. Cir. 1984). It is incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *See In re Fine*, 837 F.2d, 1071, 1073 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966), *viz.*, (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; and (3) the level of ordinary skill in the art. Additionally, in making a rejection under 35 U.S.C. § 103(a) on the basis of obviousness, the Examiner must provide some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *KSR Int'l. Co. v. Teleflex Inc.*,127 S.Ct. 1727, 1741 (2007). Only if this initial burden is met does the burden of coming forward with evidence or argument shift to the appellant. *See Oetiker*, 977 F.2d at 1445. *See also Piasecki*, 745 F.2d at 1472. Obviousness is then determined on the basis

of the evidence as a whole and the relative persuasiveness of the arguments. *See Oetiker*, 977 F.2d at 1445; *Piasecki*, 745 F.2d at 1472.

Applicant's analysis below demonstrates that all claims are non-obvious and patentable, as an analysis following the factual inquiries laid out in Graham v. John Deere Co. clearly reveals that the findings of fact articulated by the Examiner cannot be found to support an obviousness rejection of the claimed invention.

A. The Claimed Invention

The claimed invention is directed to a package for a high frequency electrical circuit comprising a cavity formed within a material for containment of the electrical circuit. Independent claim 1 requires the conductivity of a surface extending into the cavity be adapted so as to be at least partially absorbent to EM radiation. That is to say the surface absorbs EM radiation within a cavity.

There is a significant difference between EM shielding of the prior art, and absorption of EM radiation as carried out in the present invention. An electrical shield will prevent an EM signal from passing through it. It does this, in the case of both Choon and Benzoni, by providing a very low resistance wall (e.g. a copper or silver metal layer), usually with a conductive path to ground. At suitably high frequencies, the very low resistance wall will reflect most of the energy that impinges upon it, and at lower frequencies the very low resistance wall will short the currents induced in the wall to ground. The reflection of the higher frequencies can lead the EM radiation to couple back into the circuitry housed within the package, potentially leading to problems. In contrast to this, the present invention does not attempt to provide a very low resistance path, or to reflect higher frequencies. Instead it converts the currents induced in the conductor to heat, in the same way that a resistor does. Thus, the EM radiation does not get reflected back into the cavity where it could otherwise interfere with the circuitry in the package.

This effect is maximised, as described in relation to embodiments of the present invention, by using a structure having a surface impedance which is adapted to be substantially similar to that [i.e. the modal impedance] of a predicted EM field within the cavity enclosing the circuitry. The characteristic impedance of the space within such a cavity at a resonant frequency is given by the ratio of the electric field magnitude to the Magnetic field magnitude of the resonant EM mode. For such a resonance to occur within a cavity of finite dimensions, it is not

possible for either the Electric field magnitude to be zero, or the Magnetic field magnitude to be infinite. It is therefore not possible for the ratio of the first to the second to be zero. Consequently, presenting a surface of very low impedance (as used by both Choon and Benzoni) into the cavity would not serve the purpose of absorbing the EM radiation coupling in to such a resonant mode of finite characteristic impedance (the purpose of the current invention)."

B. The Scope and Content of the Prior Art

1. The Choon Patent

Choon discloses a compartmentalized shielding system which is intended to provide electrical isolation between adjacent electrical circuits such as a transmitter-receiver pair. (See Bannister Dec. at ¶5). In particular, Choon discloses a single shielding box having a partition that separates the box into two distinct physical compartments, and which is designed to prevent or significantly reduce the electromagnetic (EM) radiation passing from one compartment to another. (Bannister Dec. at ¶5).

The mechanism by which the EM radiation is prevented from passing from one compartment to another in Choon is a shielding barrier between the two. The barrier specifically has electromagnetic shielding properties, and is preferably made from a metallic material - pre-tinned Brass - although no other material is mentioned. *Id.* The action of such a shielding barrier, made from a highly conductive material such as that preferred, is to provide a plane at which the tangential component of the electric field, E, and the normal component of the magnetic field, H, associated with any EM field within a compartment, collapse to zero, thereby preventing propagation of the EM field beyond the barrier. *Id.* It thereby ensures that each compartment within the overall package is isolated in electromagnetic terms, from every other compartment.

2. The Miska Reference

Miska discloses a gasket designed to seal a metallic housing or similar, to prevent the entry or exit of EM radiation to or from the housing, to provide electromagnetic isolation of components inside the housing and to provide a continuous conductive path around the inner surface of the housing. (Bannister Dec. at ¶5). The gasket of Miska is designed to be hardwearing and is suitable for use where movement may occur, such as on door edges. Small gaps between or within the walls of an enclosure, or between the walls and a door of an enclosure can allow the escape of EM radiation. *Id.* The gasket of Miska is designed to fill these gaps. All embodiments disclosed in

Miska comprise a conductive layer, with preferred embodiments also having additional layers to provide the ability to withstand abrasion. *Id.* All Miska embodiments feature a highly conductive metallic layer for conducting currents between the surfaces in contact with the gasket. *Id.*

3. The Benzoni Reference

Benzoni discloses a housing suitable for incorporating circuitry on a substrate that, in the embodiments disclosing a partition member, uses the partition member to divide the housing into separate physical compartments, with circuitry on one part of the substrate being in a different compartment to circuitry on another part of the substrate. (Bannister Dec. at ¶5). The partition member has a conductive coating applied thereto, and the purpose of the partition member is to prevent EM radiation from circuitry on one side of the partition from passing through to the other side of the partition and interfering with circuitry there. Therefore Benzoni is similar in principle and operation to the Choon disclosure, with a difference being that Benzoni provides for the containment of a single circuit board across more than one physical compartment. *Id.* In this case, the circuit board has on it a conductive trace, to maintain a continuous conductive path between all metalised surfaces of the housing. *Id.*

Further, in Benzoni, all inner surfaces of the housing and lid are uniformly plated (with no gaps of greater than one half of the shortest wavelength of any frequency of interest) with an electrically conductive material, such as copper. *Id.*

4. The Henry Reference

Henry discloses a house or other dwelling having a shielding layer applied to the walls in the form of a paint designed to absorb EM radiation at the free-space characteristic impedance of 377 Ohms. (Bannister Dec. at ¶5). The invention is designed to prevent occupants of the dwelling from being exposed to EM radiation entering from outside the building. Henry therefore discloses paint of a shielding nature as in the Choon and Benzoni references discussed above, but with the difference that Henry is not designed to shield or protect electronic circuitry, and that the physical scale is very different. *Id.*

C. Differences Between the Claimed Invention and the Prior Art

Choon does not in any way address the issue of resonant modes within cavities (such as compartments). Choon also does not disclose the use of any partially absorbent element to attenuate or eliminate such modes. As a result Choon does not disclose the adaptation of the conductivity of

the compartment wall - or indeed of any other surface - to facilitate the absorption of EM radiation. (Bannister Dec. at ¶5). Likewise, Miska, Benzoni and Henry do not disclose or in any way discuss the attenuation or elimination of electromagnetic modes within any enclosure. *Id.*

D. Traverse Of The Prior Art Rejections

1. The Choon/Miska Obviousness Rejection

Claims 1, 5-6, and 8-22 are rejected for obviousness over Choon et al (USP 5,608,188) in view of Miska (USP 6,901,660). Regarding independent claim 1, it is the examiner's position that Choon discloses all of the claims features except for "the conductive material such as nichrome or carbon being adapted to [be] partially absorbent to electromagnetic radiation." The examiner relies upon Miska for disclosing the use of nichrome to prevent oxidation and concludes it would have been obvious to one skilled in the art at the time of the invention to use nichrome or carbon as the Choon conductive material for purposes of preventing oxidation and that the nichrome or carbon would "inherently" absorb electromagnetic radiation. Regarding the claim requirement of a conductive region having a conductivity adapted to be at least partially absorbent to electromagnetic radiation, the examiner cryptically indicates "functioned as claimed" without further explanation or citation to a reference as disclosing the feature. (See page 2 of the February 9, 2009 Office Action).

Claims 1, 5-6 and 8-22 are non-obvious and patentable because the examiner has not made out a prima facie case and because the claimed invention provides an unexpected result not disclosed or suggested in the prior art. In response to Claim 1's important limitation "the conductivity thereof being adapted to be at least partially absorbent to electromagnetic radiation", the examiner merely states "(functioned as claimed)" which is not clear, and which fails to point out where in Choon the particular limitation appears. At minimum, the examiner's rejection does not meet the requirements for establishing a prima facie case of obviousness because the examiner has not provided a factual basis that demonstrates the claim feature is found or know in the prior art. That is because Choon does not disclose the feature. For this reason alone the examiner's obviousness rejection must be withdrawn.

Moreover, the examiner cannot make out a prima facie case of obviousness because the cited prior art does not disclose or suggest all of the claim 1 features. Paragraphs 5 and 6 of the Bannister declaration make it very clear that the mechanism by which Choon works differs from

the present invention. Specifically, the Declaration shows that Choon works by providing two isolated cavities with a wall preventing EM radiation in one cavity from penetrating into the adjacent cavity. (Bannister Dec. at ¶¶5-6). In contrast, the present invention relates to the attenuation of resonant modes in a single cavity. In addition, claims 1, 5-6, and 8-22 are also non-obvious and patentable because the cited prior art fails to disclose the limitation of independent claims 1, 15 and 19 regarding the material extending into the cavity that "the conductivity thereof being adapted to be at least partially absorbent to electromagnetic radiation".

The combination of Miska with Choon does not add any strength to the examiner's position, as Miska is also missing key aspects of the current invention. Firstly, Miska is aimed at a different field to the present invention, in that it is not aimed at the suppression of EM fields within a cavity. Instead Miska, like Choon, is aimed at preventing EM fields escaping from a cavity. Secondly, Miska does not disclose materials extending into the cavity that are adapted to be at least partially absorptive of EM radiation. By looking at Miska col. 4, line 51 it can be clearly seen that Miska discloses a "highly conductive metal" layer. One of ordinary skill in the art at the time of the invention would understand such a highly conductive metal layer NOT to be adapted to be at least partially conductive as claimed. Moreover, Miska describes, as seen in Figure 4, a layered structure 28, wherein nichrome may be one layer 30. On top of this is layer is deposited a second layer 32, which is a highly conductive metal, as described in column 4 lines 45-52. In the two layered structure, any currents induced will flow in the highly conductive layer and will not flow in an adjacent, more resistive layer. (See Bannister Dec. at ¶6). As a result, the examiner's comments relating to the nichrome layer of Miska acting as an absorber in Choon are therefore incorrect as one skilled in the art at the time of the invention that was modifying Choon with Miska to prevent oxidation would apply the same two layer structure of Miska to cover the Choon wall with the result being an exposed highly conductive material on the wall that blocks but does not at least partially absorb EM radiation.

It appears that the examiner may be assuming the claim term "conductive region" to mean conductive like an ordinary metal. However, the adaptation of the conductivity as described in claim 1 actually makes the material resistive, as would be easily appreciated by one of ordinary skill in the art. The combination of Choon and Miska therefore does not result in the current invention as claimed in claim 1. This point is again backed up by Mr. Bannister's Declaration,

which states that the metallic layers on which the nichrome or carbon lies will act electrically as a short circuit, and so prevent significant absorption from occurring in the nichrome or carbon layers. It also states that Miska does not disclose the adaptation of conductivity to as to make the carbon or nichrome layers partially absorbent. (See Bannister Dec. at ¶6).

Similar limitations to those in claim 1 that are lacking in the cited prior art are present in independent claims 15, 18 and 19, and so the arguments above apply to those independent claims as well. The remaining claims cited in respect of Choon are dependent upon these independent claims and so are non-obvious and inventive over Choon in view of Miska for at least this reason.

Finally, it is not clear from the Office Action whether Miska is being combined with Choon and applied against all rejected claims 1, 5-6, and 8-22, or just against claims 13-14 which mention nichrome and carbon. However, either way, Miska has been shown above to be not relevant.

2. The Benzoni/Miska Obviousness Rejection

Claims 1-20 and 23-27 stand rejected for obviousness over Benzoni (USP 5,416,668) in view of Miska. It is the examiner's position that Benzoni discloses all of the features of independent claim 1 except for a conductive material such as nichrome or carbon being adapted to be partially absorbent to EM radiation. The examiner justifies the combination of references for the same reasons recited with respect to the Choon obviousness rejection above. Claims 1-20 and 23-27 are non-obvious and patentable at least for the reasons recited below.

Claims 1-20 and 23-27 are non-obvious and patentable at least because the combination of Benzoni and Miska would not result in the claimed invention as the examiner maintains. As noted above, Miska describes, as seen in Figure 4, a layered structure 28, wherein nichrome may be an underlying layer 30. On top of this is deposited a second layer 32, which is a highly conductive metal, as described in column 4 lines 45-52. In the two layered structure – where the nichrome layer is covered - any currents induced will flow in the highly conductive layer and will not flow in an adjacent, more resistive layer. (See Bannister Dec. at ¶6). As a result, the examiner's comments relating to the nichrome layer of Miska acting as an absorber are therefore incorrect as one skilled in the art at the time of the invention that was modifying Benzoni with Miska to prevent oxidation would apply the same two layer structure of Miska to cover the

Benzoni wall with the result being a wall that blocks EM radiation but that does not at least partially absorb EM radiation in the cavity that is emitting the EM radiation.

Claims 1-20 and 23-27 are also non-obvious because the combination of Benzoni and Miska together do not disclose all of the features of independent claim 1. As with Choon, the present invention is differentiated over Benzoni because Benzoni does not disclose the adaptation of the conductive surface to be at least partially absorbent to EM radiation. Instead, Benzoni uses a highly conductive plating, such as copper (see col. 3 lines 30-31), to provide a "low resistance electrically conductive coating that effectively blocks, or shields" EM radiation. This understanding of Benzoni also flows from the reference abstract which states "the conductive coating [on the shielded member] provides shielding for the cavity with currents induced in the conductive coating on the housing conductible to a trace on the substrate by way of the conductive coating on the integral mounting post." Therefore there is no absorption taking place in the shield member of Benzoni, and increasing the resistance of the conductive coating (as occurs in the present invention by means of the adaptation of the conductivity of the material) would be contrary to the teachings a purpose of Benzoni by reducing the current flow to a trace on the substrate. (See Bannister Dec. at ¶6). In other words, Benzoni and Choon teach away from the combination.

In addition, the examiner has not shown where the claim 1 limitation "the conductivity thereof being adapted to be at least partially absorbent to electromagnetic radiation" is found in Benzoni. In the Office Action, the examiner refers back to the abstract of Benzoni for disclosing this feature. However, there is nothing in the Benzoni abstract that discloses this claim 1 limitation. Although Applicant has previously pointed out this shortcoming to the examiner, no clarification has been provided.

The comments relating to Miska in Section II(D)(1) above are applicable here and incorporated by reference. Miska does not disclose or suggest any of the claim features missing from Benzoni and claim 1 is not obvious over the combination of references.

Similar limitations to those in clam 1 are present in independent claims 15, 18 and 19, and so the arguments above apply to these also. The remaining claims cited in respect of Benzoni are dependent upon these independent claims and so are novel and inventive over Benzoni in view of Miska for at least this reason.

Claim 23 is independently patentable. Claim 23 stands rejected for being obvious over Benzoni in view of Miska. The examiner maintains that slots 48, 50 in Figure 1 of Benzoni disclose the features of claim 23. That is not correct. The slot 48, 50 of Benzoni act as supports for the partition member 52. This partition member is, as is actually part of wall that separates two independent cavities, and therefore is not a "material extending into the [single] cavity as is claimed in claim 1. The slots 48, 50 therefore are part of the wall of the two cavities formed by the partition, and not a feature of a single cavity. Thus claim 23 along with claims 24 and 25, are non-obvious. (See Bannister Dec. at ¶6).

3. The Benzoni/Miska and Henry Obviousness Rejection

Claims 28-33 stand rejected for obviousness over Benzoni in view of Miska and further in view of Henry (USP 5,098,735). It is the examiner' position that Benzoni discloses all of the features of the rejected independent claims except for a conductive material such as nichrome or carbon being adapted to be partially absorbent to EM radiation. The examiner relies upon Miska for supplying this missing teaching. The examiner justifies the combination of references for the same reasons recited with respect to the Choon obviousness rejection above. In addition, the examiner admits that Benzoni does not disclose the resistivity feature of claim 28. The examiner relies upon Henry for disclosing the feature and justifies the combination of references on the basis that the claimed resistivity would block microwave radiation.

As an initial matter, independent claims 28 and 33 contains similar limitations to those of claim 1, and so the above arguments above relating to the patentability of claim 1 over Benzoni and Miska apply equally to claims 28-33.

Claims 28-33 are also non-obvious and patentable because Henry is not relevant to the present invention. The application to which Henry is put is that of preventing the ingress of electromagnetic energy to a house. Contrary to this, the present invention is aimed at suppression of EM fields that are already in existence within a cavity, and this typically being a cavity several orders of magnitude smaller than a house. Therefore a person having ordinary skill in the art at the time of the invention would view Henry as being of no relevance to solving problems associated with the claimed invention. Indeed, Henry teaches a specific value of resistivity of 377 Ohms/square. This value is chosen clearly for the purpose of providing a match between the resistivity of the surface, and the characteristic impedance of unbound free-space (377 Ohms).

Such an approach, involving the matching of the resistivity of a surface, in Ohms/square, to the characteristic impedance of an unbound medium, in Ohms, will result in the absorption of EM energy by the surface, if and only if the surface covers an area which is infinite in all dimensions by comparison with the largest wavelength to be absorbed. Such an approach is not relevant to the problem solved by the present invention of suppressing EM modes within a cavity wherein the shortest dimension of the element used to absorb EM energy will frequently be significantly shorter than the wavelength of each mode.

Furthermore, in contrast to the impedance of an unbound medium, the characteristic impedance of a mode existing within a bounded medium, such as a cavity, will be affected by the dimensions of the cavity. The wording of claim 28, "the conductivity thereof being adapted to be at least partially absorbent to electromagnetic radiation, with the conductive region having a resistivity of between 100Ω/square and 1kΩ/square" refers to the need to alter the resistivity of a finite surface (that of the absorbing member, or vane) in such a way as to alter its surface impedance according to the dimensions of the cavity and the impedance of the resulting dominant mode.

Claims 29-33 are all dependent upon claim 28 and so are novel and inventive over the cited art for at least this reason.

There is further strong evidence why Choon and Benzoni are not relevant to the present invention. This is that both documents describe housings wherein a shielding wall acts to divide a single cavity into two separate cavities. The very title of Choon makes this clear " Multi-compartment EM Energy Shield". The Choon abstract also states "The partition including a mounting edge and being arranged and constructed to electromagnetically divide the enclosure into multiple compartments". Benzoni also uses a partition member (52) to divide one cavity into two, electromagnetically isolated cavities. See for example column 3 lines 43-40, and col. 3 line 68 to col. 4 line 3. It is clear from this that any coatings applied to the partition members of Choon or Benzoni will act in the same manner as coatings applied to the other walls of those cavities, and the partition should not be regarded as being an element of a single cavity. To argue otherwise would be akin to arguing that an internal wall of a house extends into the room or rooms created by its construction, when of course it instead acts to define two or more separate rooms.

Once a cavity has been divided into two separate cavities in the manner of Choon and Benzoni, then it is clear that the present invention differs in that it has a "material extending into the [single] cavity" having the properties as claimed, whereas the prior art will just have two ordinary, but to some degree electrically isolated, cavities. This is also shown in discussion in the Bannister Declaration paragraph 6.

The present invention does not divide a single cavity into two separate cavities. It can be clearly seen from Figures 4, 13 or 14 that electrical components forming a single circuit can be present in a cavity of the present invention, whereas this is not possible in the prior art. Therefore, Choon and Benzoni are not relevant to the present invention for this reason also.

III. NEW CLAIMS 34

New claim 34 is added to the application in this Reply. New claim 34 contains the key limitation that the resistivity is adapted to be at least partially absorbent to EM radiation in the cavity. The arguments above therefore apply to it also.

CONCLUSION

Based upon the amendments and statements in favor of patentability presented above, the applicants submit that all pending application claims are now allowable. Favorable reconsideration and allowance of all pending application claims is, therefore, courteously solicited.

Respectfully Submitted,

Date: August 10, 2009

By: /A. Blair Hughes/

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Appendix A
(Declaration of David Charles Bannister)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Case No. 05-409)

In the Application of:	)	
	)	
Jeffrey Powell	)	Examiner: Hung V. Ngo
	)	
Serial No. 10/535,684	)	
	)	Group Art Unit: 2831
Filed: May 19, 2005	)	
	)	Conf. No.
Title:		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RULE 1.312 DECLARATION

I, David Charles Bannister residing at 1, Conference Grove, Crowle, Worcester WR7 4SF, United Kingdom, declare as follows:

1. I am an employee of the assignee of the above-captioned patent application.

2. My CV setting forth my education, publications, and work experience is attached as Exhibit A.

3. I am currently employed as a Business Development Manager, in the area of microwave and millimeter-wave technology. My background is in the design of microwave and millimeter-wave circuits and modules. I have worked in the area of microwave and millimeter-wave technology for 20 years, and have presented at several technical and business-focused conferences world-wide.

4. I have reviewed the above-identified patent application, the pending claims, the outstanding Office Action and the following prior art references:

    US5608188 - "Choon"

    US6901660 – "Miska"

US5416668 – "Benzoni"

US5098735 – "Henry"

5. **Discussion of prior art cited by Examiner**

Discussion of Choon: Choon discloses a compartmentalized shielding system, the purpose of which is to provide a degree of electrical isolation between adjacent electrical circuits, such as a transmitter-receiver pair. The disclosure shows a single shielding box having a partition that separates the box into two distinct, physical compartments, and which is designed to prevent or significantly reduce the electromagnetic (EM) radiation passing from one compartment to another.

I understand the mechanism by which the EM radiation is prevented from passing from one compartment to another to be the introduction of a shielding barrier between the two. The partition specifically has electromagnetic shielding properties, and is preferably made from a metallic material – pre-tinned Brass – although no other material is mentioned. The action of such a shielding barrier, made from a highly conductive material such as that preferred, is to provide a plane at which the tangential component of the electric field, E, and the normal component of the magnetic field, H, associated with any EM field within a compartment, collapse to zero, thereby preventing propagation of the EM field beyond the barrier. It thereby ensures that each compartment within the overall package is isolated in electromagnetic terms, from every other compartment.

I therefore understand the purpose of the structures disclosed by Choon et al in US5608188 to be to provide a package within which different circuit assemblies are isolated from each other by the formation of compartments within the package. The patent does not in any way address the issue of resonant modes within cavities (such as compartments). Nor does it anticipate the use of any partially absorbent element to attenuate or eliminate such modes. Nor, therefore, does it anticipate the adaptation of the conductivity of the compartment wall – or indeed of any other surface – to facilitate the absorption of EM radiation.

Discussion of Miska: Miska discloses a gasket designed to seal a metallic housing or similar, to prevent the entry or exit of EM radiation to or from the housing, to provide electromagnetic isolation of components inside the housing and to provide a continuous conductive path around the inner surface of the housing. The gasket of Miska is designed to be hardwearing and so suitable for use where movement may occur, such as on door edges. Small gaps between or within the walls of an enclosure, or between the walls and a door of an enclosure can allow the escape of EM radiation. The gasket of Miska is designed to fill these gaps. All embodiments disclosed in Miska comprise a conductive layer, with preferred embodiments also having additional layers to provide the ability to withstand abrasion. All embodiments feature a highly conductive metallic layer for conducting currents between the surfaces in contact with the gasket.

In common with Choon et al, Miska does not disclose, anticipate or in any way discuss the attenuation or elimination of electromagnetic modes within any enclosure.

Discussion of Benzoni: Benzoni discloses a housing suitable for incorporating circuitry on a substrate that, in the embodiments disclosing a partition member, uses the partition member to divide the housing into separate physical compartments, with circuitry on one part of the substrate being in a different compartment to circuitry on another part of the substrate. The partition member has a conductive coating applied thereto, and the purpose of the partition member is to prevent EM radiation from circuitry on one side of the partition from passing through to the other side of the partition and interfering with circuitry there. Therefore it is similar in principle to the Choon disclosure, with a difference being that it provides for the containment of a single circuit board across more than one physical compartment. In this case, the circuit board has on it a conductive trace, to maintain a continuous conductive path between all metalised surfaces of the housing.

All inner surfaces of the housing and lid are uniformly plated (with no gaps of greater than one half of the shortest wavelength of any frequency of interest) with an electrically conductive material, such as copper. In common with Choon et al, there is no indication whatsoever of Benzoni anticipating the adaptation of the conductivity of any surface within the package, for the purpose of absorbing electromagnetic energy associated with any cavity mode.

Discussion of Henry: Henry discloses a house or other dwelling having a shielding layer applied to the walls in the form of a paint designed to absorb EM radiation at the free-space characteristic impedance of 377 Ohms. The invention is designed to prevent occupants of the dwelling being exposed to the EM radiation. The disclosure is therefore of a shielding nature as in the Choon and Benzoni citations discussed above, but with the difference that it is not designed to shield or protect electronic circuitry, and that the physical scale is very different.

Again, and in common with Choon et al Miska and Benzoni, there is nothing disclosed by Henry that anticipates the attenuation or elimination of electromagnetic modes within an enclosure.

6. **<u>Claims of the present application</u>**

Claim 1 of the present application (10/535684) has the following limitations amongst others:

a) a material extending into the cavity, the material having a conductive region; and

b) the conductivity thereof being adapted to be at least partially absorbent to electromagnetic radiation.

I do not see Choon or Benzoni as having limitation a), because the partition mentioned in those documents is used in effect to create two independent cavities. Once a partition, as described in both Choon et al and Benzoni has been introduced into a package, its function is that of a conducting wall.

I do not see Choon or Benzoni as disclosing limitation b), as the walls (including the partition element) of both are coated in a conductive material, but no suggestion is made in them that the conductivity is adapted to be partially absorbent to EM radiation. Such adaptation would involve a deliberate reduction in the conductivity of the material, so as to introduce resistive losses. In the case of a wall or partition, such as those disclosed by Choon et al and Benzoni, this would run counter to the very purpose of the structure. A wall or partition is introduced to act as an electromagnetic shield. Any reduction in the conductivity of such a shield would, as well as introducing resistive loss as described above, also result in signal leakage from the enclosure. I believe therefore that a person of ordinary skill in the art would see, on reading either Choon or Benzoni, that the conductive layers applied to the partitions would be configured to be as conductive as possible given other constraints such as metal thickness, metal type etc. There would therefore be no adaptation of the conductivity so as to be at least partially absorbent to EM radiation, as required by limitation b).

The only cited prior art which describes the use of a surface with a preferred impedance other than zero is Henry, which describes a surface with an impedance of 377 Ω/Square. This surface impedance is used to provide a match to the characteristic impedance of unbound free-space (377 Ω). It would be obvious to someone of ordinary skill in the art that applying a resistive surface to the edges (walls) of a cavity – as would result from the application of the teaching of Henry to the patented structures of Choon et al and Benzoni – would result in minimal absorption of resonant cavity modes, as the tangential E-field associated with such a mode is minimal at the walls of such a cavity. Any absorber aimed at damping a resonant mode within a cavity would need, in order to have maximum effect, to be introduced at or near the centre of the cavity – as in the present application.

Features a) and b) do not appear in Miska. Although materials such as nichrome and carbon are mentioned as layers of the gasket, they are laid on top of highly conductive metallic layers such as silver or copper. These metallic layers act

electrically as a short circuit, and appear in parallel with any greater resistance of the nichrome or carbon. Therefore any currents induced in the gasket of Miska would flow almost entirely in the metallic layers and so would not be absorbed in the nichrome or carbon material. Furthermore, Miska does not disclose any adaptation of the nichrome or carbon layers to be at least partially absorbent to EM radiation. It would not be in the interests of anyone using the teaching of Miska, Choon or Benzoni to adapt the conductivity of its coatings to be anything other than as conductive as possible, as their purpose is to permit the free flow of induced currents to ground, thereby containing the EM radiation generated on one side of a boundary, to that side.

Claim 23 states as follows: " A package as claimed in claim 1 wherein the region having thereupon the conductive material resides in a slot located in a dielectric material in the cavity." I do not believe that such a structure, i.e. that of a dielectric containing a slot that itself contains conductive material having a conductivity modified according to claim 1 is disclosed in any of the above cited prior art documents. The partitions of Choon and Benzoni, as well as being highly conductive, do not reside within a slot in dielectric material.

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Sec. 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

[DECLARANT]

Date: 9th July 2009

Curriculum Vitae for Dave Bannister

Dave Bannister joined The Royal Signals & Radar Establishment, RSRE, Malvern, following completion of his MSc in Microwave Solid State Physics in 1989. Since then, his career has been focussed on the development of Microwave and Millimetre-Wave technology based solutions for both military and commercial customers. Since 2001, Dave has played leading roles in identifying commercial markets for QinetiQ's Microwave and Millimetre-wave technology and design skills. He has acted as QinetiQ's main representative within the International Wireless Industry Consortium, thereby raising the profile of the companies' technology and capabilities in wireless domains, including communications.

April 2008-present: Responsible for investigating commercial markets for QinetiQ's background IP. This work has involved the identification of adjacent market opportunities requiring the same skills and IP, the recognition of appropriate customers and partners, the sizing of the market, and the recognition of QinetiQ's USPs. This work uncovered significant opportunities for QinetiQ in the cellular (LTE and WiMAX) backhaul space.

April 2005 - April 2008: Proposition development manager and technical strategy manager: Responsible for developing commercial propositions centred on QinetiQ's capabilities in the areas of MMIC design, Millimetre-wave front-end development and Communications Systems development.

Business Stream Manager: Responsible for developing business opportunities based on QinetiQ's MMIC design and mm-wave module capabilities. Secured continued sale of these design capabilities into the Passive mm-wave imaging programmes within QinetiQ, as well as securing a technology license deals with external customers

MMIC Design Engineer: Working on a number of military and commercial contracts. Specialising in the design of mm-wave receiver front-end MMICS. Was appointed Business Stream Manager for the technology, in 2000.

External Publications:

1. 'A 44GHz low noise block downconvertor MMIC suitable for EHF-satellite communications applications' A.R.Barnes, D.C.Bannister, M.T.Moore. Radio Frequency Integrated Circuits Symposium, 1998. IEEE 07/07/199807/1998.
2. 'A 60GHz integrated sub-harmonic receiver MMIC' C.A.Zelley, A.R.Barnes, D.C.Bannister, R.W.Ashcroft. Gallium Arsenide Integrated Circuits (GaAs IC) Symposium, 2000.
3. 'A 2 – 18GHz wideband high dynamic-range receiver MMIC' D.C.Bannister, C.A.Zelley, A.R.Barnes. IEEE Radio Frequency Integrated Circuits (RFIC) Symposium, 2002.
4. 'Enabling cost-effective ACC front-ends'. D.C.Bannister, International Wireless Industry Consortium (IWPC) colloquium, Stuttgart. October 2004.
5. 'Commercial applications for Millimetre-Wave MMICs'. Jeff Powell and Dave Bannister. IoP Publishing, Technology Tracking, January 2005.
6. 'MILTRANS – Millimetric Transceivers for Transport Applications' D.J.Gunton et al (inc D.C.Bannister). 2005

7. 'Advances in millimetre-wave technology'. Gabriel Vizzard & Dave Bannister. International Wireless Industry Consortium (IWPC) Colloquium, Dulles, Washington D.C, June 2007.
8. 'Spectrally efficient P2P radios for global data backhaul markets'. Dave Bannister. International Wireless Industry Consortium (IWPC) Colloquium, Milan. January 2008

Qualifications:

BSc (Hons) Physics, Portsmouth Polytechnic, 1987
MSc Microwave Solid-State Physics, Portsmouth Polytechnic, 1989